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Living a Complex Life at Low Reynolds Number

By On Shun Pak
Assistant Professor
Department of Mechanical Engineering
Santa Clara University

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For More Information Contact: Bin Liu, bliu27@ucmerced.edu

Abstract:

Microorganisms live in a world of low Reynolds number where viscous forces dominate. The absence of inertia imposes stringent constraints on the types of effective locomotion strategies in the microscopic world. In addition, biological fluids, such as respiratory and cervical mucus, typically display complex rheological properties such as viscoelasticity and shear-thinning viscosity. The fundamental question whether these nonlinear rheological properties enhance or hinder locomotion at small scales has attracted considerable attention recently. In this talk, we will consider different idealized models to elucidate how non-Newtonian fluid rheology influences propulsion at low Reynolds number, and discuss the possibilities of exploiting these complex fluid properties in the design of artificial micro-propellers.

Bio

On Shun Pak obtained his BEng in Mechanical Engineering from the University of Hong Kong in 2008, and his PhD in Mechanical Engineering from the University of California, San Diego (UCSD) in 2013. On Shun then continued his research as a Postdoctoral Research Fellow at Princeton University, before joining the Department of Mechanical Engineering at Santa Clara University as an Assistant Professor in 2014. His research interests lie in fluid mechanics at microscopic scales, with an emphasis on problems at the interface of biology and fluid mechanics.